REVIEW OF BUILDING ENERGY TRACKING SYSTEMS

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Introduction

Energy Management Systems (EMS) are a type of software that monitor the energy consumption in buildings. Its purpose is to minimize costs by monitoring energy consumption and optimizing energy use. EMS has become increasingly popular in the past fifteen years and is used primarily by businesses to save money by tracking and reducing energy consumption in their buildings. It can also be used in state and local government facilities to measure the energy consumption.

While a few software options are available, each product has unique features. This paper reviews different energy management systems based on their features and functionalities to provide recommendations on the best-fit system for the Anne Arundel County.

Use of EMS in Other Counties

Energy managers in various counties were surveyed with respect to their energy management systems. Most Maryland counties do not have county-level energy management systems in place. Allegany, Caroline, Cecil, Dorchester, Montgomery, Queen Anne's, Worcester, and Baltimore County do not use EMS. Wicomico, Carroll, and Queen Anne's counties have building automation systems (BAS) but haven't used any system to track energy usage.

BAS is installed in individual buildings to control heating, air conditioning, lighting, and other systems. The main difference between BAS and EMS is that EMS tracks the data while BAS controls the data. Some systems, e.g. Distech Controls and Bemoss, can integrate both tracking and control. However, no Maryland county has established a county level system for energy management. They still rely on utility companies to monitor energy use. Nor do these counties incorporate energy costs and operations into capital project planning.

Review of Energy Management Systems Options

EMS can be either general products that apply to typical buildings or customized for specific users and facilities. Table 1 summarizes popular systems on the market.

Table 1: Comparison of Different Energy Management Systems

Cylon is user-friendly commercial energy management software. Energy data is reported in real time through charts, reports, and alarms. While it is possible to connect an unlimited number of meters to the system, there is also a fee for the software. The more meters added to the software the higher the price of the software, with 250+ meters being the maximum price. Cylon energy management can work with any meter and is able to track the energy consumption for both large commercial buildings and smaller residential ones. The software can be tailored to the client's needs. Another feature is its ability to monitor multiple sites from any location, since Cylon has central monitoring. Cylon technical assistance is located in Dublin, which makes one-on-one technical assistance nearly impossible. However, technical assistance is offered over the phone with 24/7 support.

RtEMIS energy management software is made by RtTECH. It can handle any type of building and has an automated system that tracks a building's energy use and demand. A building's energy demand is presented in a report and tracked in real time. Data is tracked in both dollars and energy use. Reports are accessible anytime through a secure login or mobile application, allowing multiple people to access the information. RtEMIS is available through Microsoft Azure Cloud, which allows for fast installation. The software can be set up on multiple sites, and can be connected to many different meters. There is a cost associated with downloading and installing the software. While technical assistance is provided, the usability of this software is only moderate and can sometimes be difficult to navigate.

Building IQ is a commercial software that can monitor any building regardless of size. Data is tracked in real time and presented in reports and graphs. The user also has

automated control. With the ability to manage a portfolio of buildings, Building IQ can help a building gain one to five stars in energy star ratings, as designated by the Environmental Protection Agency. A cost is associated with downloading this software, although the up-front cost is low according to their website. The software gives only one person access to the energy portfolio. Building IQ has strong technical assistance with on-call engineers 24/7 and someone monitoring data for overconsumption or minor maintenance issues. This software is also user-friendly and easy to navigate.

EEM Suite is a software developed by McKinstry and used by the University of Maryland. This software tracks energy use in real time and can produce charts and graphs for the user to analyze. Other features of EEM Suite software include the unlimited number of buildings that can be tracked and the ability to monitor energy consumption regardless of building size. Technical assistance is offered 24/7 for this product. Energy consumption can be monitored remotely through a secure web page, allowing multiple people to access the data via login information. There is a fee for this software but the software will be tailored to the customer's needs. EEM Suite is not very user-friendly. The software is hard to navigate and more suited to tracking data than managing or analyzing it.

Bemoss software is designed to help reduce energy consumption and optimize electricity use. There is a cost for downloading and installing Bemoss. This software is most effective tracking energy consumption in medium and small commercial buildings. Remote data monitoring is available with this software, allowing off-site tracking of energy consumption. Bemoss can only monitor one building, not a portfolio of buildings. Technical assistance is offered for this user-friendly software. Bemoss is adaptable to multiple types of systems.

Distech Controls software tracks energy consumption to reduce energy waste in buildings. Since Distech is a commercial product there is a fee to buy their products. Distech Controls includes the ability to track energy consumption from a smartphone. Energy reports are made in real time and presented in charts and graphs so the data is easy to understand. This particular energy management software is able to track a large

portfolio of varied buildings. Unfortunately, each tracking system is separate, with one for HVAC, one for plumbing, and so on. A comprehensive energy evaluation requires purchasing multiple software programs. Distech does offer technical assistance to its customers.

Energy Star is a portfolio manager created by the EPA to measure and track energy consumption. Energy Star software is easy to use and can produce charts, graphs, and reports of energy consumption. Access to the data is through a secure web page, with a login, which allows multiple users to remotely access the data. It is also possible limit what others can do once on the site. For example, restrictions can be set to allow only one person to edit the date, while multiple people can access the data. In addition, once on the site it is easy to print out results as Excel files. The software can track a large portfolio of buildings, and can work with any building and meter type. Energy Star offers technical assistance through training sessions, technical information, and management tools. There is no cost for Energy Star. Information is easily populated into the system.

Comparison and Recommendation

Table 2: Ranking of Different Energy Management Systems

	CYLON	RtEMIS	ENERGY STAR	EEM Suite	BUILDING IQ	BEMOSS	DISTECH Controls
Portfolio Capacity	3	2	3	3	3	1	2
Building Diversity	2	2	2	2	2	1	1
Number of Users	2	2	2	2	1	1	2
Cost	1	1	2	1	1	1	1
Technical Support	1	1	1	1	1	1	1
Data Presentation	2	1	2	1	1	1	1
Data Update Frequency	2	2	1	2	2	NA	2
Usability	2	1	2	1	2	1	1
TOTAL	15	12	15	13	13	8/9	11

Note: NA represents not available, 1 represents lower capacity, 2 represents middle capacity, 3 represents higher capacity

Each software was evaluated by comparing answers to a series of questions: How many buildings can be tracked? What types of buildings can the software handle? How often does the software update? How is the information presented? Is the software user-

friendly? Do you have to be in or near the building to be able to access the energy information or is it possible to access the information remotely? Can multiple people have access to the software? Is technical assistance available? What other features does the software have?

Table 2 evaluates these criteria for each software on a numerical scale, with the highest numbers being the best options and the lowest numbers being the worst. NAs means there is no information about that criteria on the software's website, so the comparison is based on the assumption that it does not exist. Most criteria are ranked 1 or 2, where 2 is the better feature. For example, under the criteria "number of people with access," 2 means multiple people can access the information and one means only one person can access the information. The criteria for "Portfolio capacity" is ranked 3, 2, 1 with 3 signifying an unlimited amount of buildings, 2 a large amount of buildings, and 1 for one building.

Based on the total number of points each software received, the ranking stands (from best to worst) Cylon and Energy Star, EEM Suite, RtEMIS and Building IQ, Distech Controls, and finally Bemoss.

Cylon and Energy Star both received 15 points tieing them for first. These two softwares differ in data frequency and cost. Cylon has a cost while Energy Star does not, giving Energy Star a higher number in this category. However, in the data frequency category, Cylon scored a 1 while Energy Star scored a zero. Cylon updates energy data every 15 minutes or in real time earning it a 1. Energy Star does not state how often it updates the data on its website, earning a zero. Basically, choosing between Cylon and Energy Star is choosing between real time updates and cost. Energy Star updates might be slow but there is no cost attached. Cylon updates in real time for a fee. Overall, I recommend Energy Star because it is cost-free and has most of the same features as Cylon. The only reason to choose Cylon is if real time information is imperative. In most situations, no-cost is more attractive than live updates.

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